

SCIENTIFIC REPORT

Sex inequalities in cataract blindness burden and surgical services in south India

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Aim: To determine sex inequalities in cataract blindness and surgical services in south India

Methods: Details of lens status and cataract surgery were recorded for subjects aged 50 years and older identified through cluster sampling as part of population based cross sectional assessments of cataract blindness and surgical outcomes in three districts of south India.

Results: Females were less likely to be operated on for cataract (adjusted OR 0.71, 95% CI: 0.57 to 0.87) although the cataract blindness burden was higher for females ($p < 0.001$). Literacy of the subject was a major predictor for being operated on for cataract. Achieving equal surgical coverage between sexes will have resulted in an additional 25.3% reduction of cataract blindness.

Conclusions: Eye care programmes in this population need to be sensitised to the substantial reduction in blindness possible by achieving equal surgical coverage between sexes.

Inequalities in burden of disease and eye care service utilisation assume significance as eye care programmes attempt to control the burden of blindness worldwide. The National Program for Control of Blindness (NPCB) in India with the assistance of a World Bank loan attempted addressing issues related to infrastructure and human resources for eye care in India.¹ Suboptimal utilisation of eye care services has been the subject of various studies from south India; such studies have reported females, illiterates, and rural residents to under-utilise cataract surgical services.^{2–5} A recent meta-analysis reported that nearly two thirds (64.5%) of the blind population of the world was female, and that 60–70% of all

cataract surgeries would have been for females if cataract surgical coverage were equal between sexes.⁶ This paper reports on the cataract blindness burden and surgical service utilisation by sex from three districts in south India.

PATIENTS AND METHODS

A cross sectional population based assessment of cataract blindness and visual outcomes of cataract surgery among people aged 50 years, identified using random cluster sampling strategy was conducted in three districts of southern India. The study methodology has been described in detail elsewhere.⁷ Briefly, the study was conducted in Sivaganga district of Tamil Nadu state (1999), Tirunelveli district of Tamil Nadu state (2000), and Palakkad district of Kerala state (2001).

A person who had any formal education was considered literate for this study. We determined the urban or rural character of the place of residence from government census records.

We defined people for whom the study ophthalmologist assigned cataract as the principal cause for blindness (best corrected vision $< 6/60$ in the better eye) in one or both eyes as cataract blind. A never operated cataract blind person was defined as a person who was blind because of cataract but had never undergone cataract surgery in either eye.

Subjects who previously had bilateral cataract surgery were presumed to be bilaterally blind at initial surgery. We also presumed subjects who previously had cataract surgery in one eye but were currently blind in the fellow unoperated eye to be bilateral blind at initial cataract surgery. We defined cataract blindness burden as the sum of the never operated cataract blind cohort plus those cataract operated subjects presumed bilaterally blind at initial cataract surgery. The proportion of subjects already operated for cataract within the cataract blind cohort was defined as surgical coverage.

Table 1 Cataract blindness burden and surgical coverage among subjects aged ≥ 50 years, by sex

	Cataract blindness burden		Surgical coverage	
	Males No (%)	Females No (%)	Males No (%; 95% CI)	Females No (%; 95% CI)
Age (years)				
50–59	111 (3.6)	248 (6.1)	81 (73.0, 63.7 to 81.0)	151 (60.9, 54.5 to 67.0)
60–69	257 (11.1)	414 (15.3)	186 (72.4, 66.5 to 77.7)	266 (64.3, 59.4 to 68.9)
≥ 70	367 (25.3)	554 (34.8)	280 (76.3, 71.6 to 80.5)	319 (57.6, 53.3 to 61.7)
Literacy*				
Literate	415 (9.5)	245 (10.0)	339 (81.7, 77.6 to 81.3)	204 (83.3, 78.0 to 87.7)
Illiterate	320 (12.9)	971 (16.3)	208 (65.0, 59.5 to 70.2)	532 (54.8, 51.6 to 57.9)
Residence				
Urban	158 (12.0)	284 (18.2)	135 (85.4, 79.0 to 90.5)	214 (75.3, 69.9 to 80.2)
Rural	577 (10.4)	932 (13.6)	412 (71.4, 67.5 to 75.1)	522 (56.0, 52.7 to 59.2)
Total	735 (10.7)	1216 (14.5)	547 (74.4, 71.1 to 77.5)	736 (60.5, 57.7 to 63.3)

*Details of education were not available for 5 males and 1 female.

Cataract blindness burden = (never operated cataract blind + already operated presumed bilateral blind)

Surgical coverage = (operated cataract blind/(operated + unoperated cataract blind))

Table 2 Adjusted odds ratios (OR) and 95% confidence intervals (95% CI) in multiple logistic regression models for bilateral blindness (vision <6/60) and cataract surgery, by sex

	Blindness OR (95% CI)	Cataract surgery OR (95% CI)
Age (years)		
50–59	1.0	1.0
60–69	2.26 (1.91 to 2.66)	1.10 (0.85 to 1.44)
≥70	5.03 (4.27 to 5.92)	0.80 (0.62 to 1.00)
Sex		
Male	1.0	1.0
Female	1.31 (1.14 to 1.51)	0.71 (0.57 to 0.87)
Literacy*		
Literate	1.0	1.0
Illiterate	2.74 (2.33 to 3.21)	0.32 (0.26 to 0.41)
Residence		
Urban	1.0	1.0
Rural	1.07 (0.90 to 2.08)	0.51 (0.40 to 0.66)

*Details of education were not available for 5 males and 1 female.

The number of additional females who would have been operated on, if the surgical coverage for females were equal to the surgical coverage for males, was determined by deducting the number of operated females from the surgical coverage for males expressed as a percentage multiplied by the sum of operated females and cataract blind females⁸ (male surgical coverage (%) × (No of operated females + No of cataract blind females) – No of operated females). We also estimated the proportion of blind that would have been cured if the surgical coverage for both sexes were equal; this was obtained as a fraction of the additional operated females over the cataract blind people (No of additional operated females/(No of cataract blind females + No of cataract blind males)) expressed as a percentage.⁸

We used STATA version 7.0 (College Station, TX, USA) for statistical analysis. χ^2 and Fisher's exact test was used as appropriate for bivariate analysis. Multiple logistic regression modelling was used to explore associations of cataract surgery with age, sex, literacy, and place of residence. Separate models for males and females were used to explore associations of cataract surgery with age, literacy of subject and family members, and place of residence. Odds ratios and 95% confidence intervals were estimated.

We obtained verbal informed consent from subjects before examination. The study protocol had been previously used in India, Nepal, and China,^{9–12} and was approved by the World Health Organization (WHO) Secretariat Committee on research involving human subjects, the Indian Council for Medical Research (ICMR), the institutional review board of Aravind Eye Hospital, and Post Graduate Institute of Ophthalmology, Madurai, India.

RESULTS

We examined 15 265 of 16 542 people aged 50 years enumerated from the three study districts—a 92.3% (range 91.4% to 93.4%) response rate. The mean age of those examined was 61.3 (SD 8.9 years, range 50–103 years) and 8399 (55.0%) were females. The study population was predominantly rural in character (n=12 390, 81.2%); and females were more likely to be illiterate (p < 0.0001).

The cataract blindness burden was higher for females (p < 0.001) (Table 1). There was no statistically significant difference for cataract blindness burden between sexes among the literates (p=0.46).

Surgical coverage for cataract (Table 1) was significantly higher for males (n=547, 74.4%) than females (n=736, 60.5%) (p < 0.001). Although not statistically significant, surgical coverage was higher for females among literates (p=0.36).

Table 3 Adjusted odds ratios (OR) and 95% confidence intervals (95% CI) for factors predicting not getting operated for cataract among subjects aged ≥50 years in a multiple logistic regression model, by sex

	Male OR (95% CI)	Female OR (95% CI)
Age		
50–59	1.0	1.0
60–69	1.07 (0.52 to 2.17)	0.77 (0.98 to 1.22)
≥70	1.23 (0.61 to 2.48)	1.37 (0.89 to 2.11)
Literacy of subject*		
Literate	1.0	1.0
Illiterate	1.77 (1.16 to 2.70)	2.49 (1.45 to 4.28)
Literacy status of family member		
At least 1 member literate	1.0	1.0
No literate member	2.47 (1.39 to 4.39)	1.84 (1.25 to 2.70)
Residence		
Urban	1.0	1.0
Rural	1.11 (0.63 to 1.95)	0.36 (0.94 to 2.41)

*Details of education were not available for 5 males and 1 female.

Cataract surgery had been performed for 2438 eyes of 1769 people. There was no significant difference in type of facility used for cataract surgery (private/NGO sector, government sector, or surgical camps) between sexes (p=0.268), or type of surgical procedure for cataract extraction (p=0.060), or for having bilateral cataract surgery (p=0.30).

There was no statistically significant difference in the use of postoperative spectacles between sexes among the cataract operated (p=0.264). Blindness rates after cataract surgery (p=0.680) and surgical complications as the cause of vision impairment and blindness was comparable between sexes (p=0.581). We estimated an additional 169 females would have been operated on if the surgical coverage for females were equal to that of males—this would have resulted in an additional 25.3% reduction of cataract blindness.

After adjusting for age, place of residence and literacy females were more likely to be blind (OR 1.31 95% CI: 1.14 to 1.51) than males (Table 2). We found the unadjusted odds (OR 0.53) for females being operated on for cataract and the odds after adjusting for age and place of residence (OR 0.51) to be nearly similar. However, the odds for females being operated on increased by 43.4% (OR 0.76, 95% CI: 0.61 to 0.95) after adjusting for literacy alone. When we included age, place of residence, and literacy in the model, the odds for females being operated on showed a 34.0% increase, although females (OR 0.71, 95% CI: 0.57 to 0.87) were still less likely to be operated on for cataracts than males (Table 2). Separate multiple logistic regression models for females and males were also used to explore associations of cataract surgery with age, education of subjects and of family members, and place of residence (Table 3). No significant associations were found with age, sex, place of residence or education, for having both eyes operated on for cataract (data not shown).

DISCUSSION

Data from our study suggest existence of a definite sex gap for cataract blindness burden and surgical service utilisation in this south Indian population—females were less likely to be operated on for cataract although females were more likely to be blind. Despite no significant difference between sexes in utilisation of facilities, type of procedures, and quality of surgical outcome, surgical coverage for females remained nearly one fifth lower than males in our study population. An additional one fourth of the cataract blindness in this population can be cured if surgical coverage was equal between sexes, suggesting that approaches addressing increased uptake of cataract surgery among females are required.

The random selection of subjects within each district, door to door enumeration of subjects, and high response rates obtained suggests that results of our study may be generalised to the population of these three districts of south India.

Although females comprised 60.5% of all cataract operated people in this population, the surgical coverage for females was still 18.7% lower than males.

Differences in surgical coverage between sexes increased with age—males aged 50–59 years received 16.6% more surgery than females, and those aged = 70 years received 25.6% more surgery than females. Eye care programmes need to be made aware that achieving sex equality in cataract surgery may mean more than operating on equal number of male and female patients. Our results indicate that sex inequities may persist even in settings that have a high surgical coverage and that three cataract blind females have to be operated on for every two cataract blind males operated to achieve sex equity.

Approaches to address the sex gap in this population may have to focus on increasing the number of females seeking care, suggesting the need for additional approaches targeting females as a high risk group even within current approaches focusing on the underserved (the rural and elderly population). A better understanding of factors predicting uptake of cataract services separately for men and women would also be useful in addressing the sex gap.

For both sexes, literacy of the affected person and family members was the most important predictor for being operated on. Compared to literate males, cataract surgical coverage was higher for literate females; blindness burden was also only marginally higher for literate females (these differences were not statistically significant). An increased awareness of cataract and treatment options may be provided to elderly subjects through health education. Additionally, eye care programmes should find ways to include education about eye diseases/blindness in current literacy initiatives. Eye care programmes have to shift focus from the existing curative approach to an approach that is more interactive with organisations active in developmental work, including educational activities, to effectively control blindness in the long run. This may be especially true for countries with developing economies, including India, that already have a huge burden of existing blindness,¹³ and currently are in a demographic transition to ageing.¹⁴

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